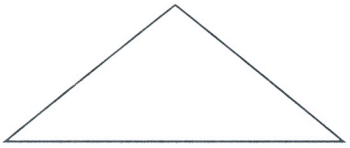
Area

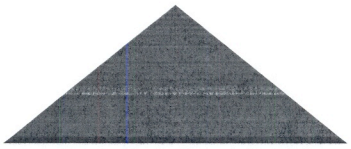
Where they keep the aliens...

No wait, that's Area 51. Who knows if they're there or not anyway? No, the area we are talking about is defined in several ways. First, it is the amount of space inside a two dimensional figure. The second could be how many square units you could fit inside a figure. (We'll get back to that one). And third, and my favorite, is how much paint do you need to paint one side of a shape. Let's look at that one...

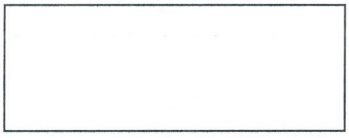
Here's a figure.



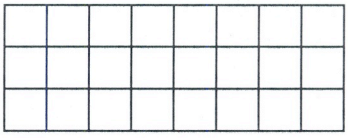
Here's the same figure with paint in it, see?



Black? Okay.. I happen to like black, but you probably wouldn't choose that color for your living room. Maybe you would, but after this chapter you could at least figure out how much paint you need. Back to the one about the square units... Let's take another figure, say a rectangle...



Divide it into tiny squares like this.



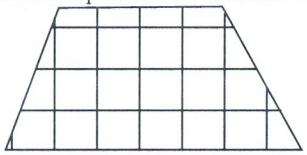
Each square is one unit long by one unit high. 1 times 1 is of course, 1 squared. Also, one square unit. So, if we could figure out how many are inside the rectangle, we would know how many square units there are, and thus be able to assign a number to the idea of area. In this case count how many square units there are inside the figure.

 = 1 sq. unit or $1u^2$

_____ square units. Good! Now if a gallon of paint covers 50,000 such square units, you know you would need about, well... a tiny drop of paint. These kinds of calculations are done all the time by construction people as well as manufacturing people and crazy people like you who are still thinking about painting your living room black... You need to know how much paint to buy, right? You don't want to buy too little and then run back to the store, or come home with a truckload and only use a half a can.

Okay, so counting all the little units is a bit frustrating. Plus, what if you have a weird shape where some of the units are cut up and thus difficult to count?

Like this....

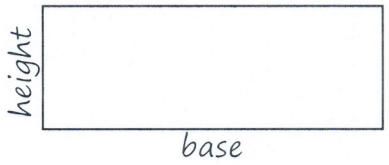


Or worse, what if someone with too much time on their hands didn't draw in all the little lines for you? Like in your living room. Here is where the formulas come in. Next page...

Area Formulas

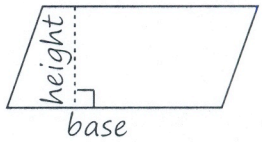
Formula for the area of a rectangle. If you multiply how many little squares there are across the bottom (called the base) times how many there are up the side (called the height) you get the same number as counting them. (Sorry for making you count all those by the way, but I had to do it for your own good.)

Rectangle: $A=bh$ Area=(base)(height)



Parallelogram. Its formula is the same as the rectangle, because if you cut a triangular chunk out of one side of a rectangle and glue it on the other side it makes a parallelogram, see..?

Parallelogram: $A=bh$ Area=(base)(height)



A note about heights: A lot of times heights are drawn for you like the one above. It looks like a dotted line because it's not part of the figure and will always have the 90° box showing it is perpendicular to the base.

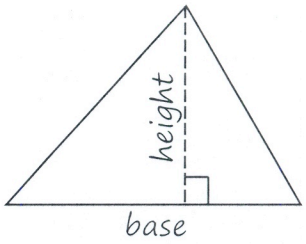
This is a height....

This is not a height...

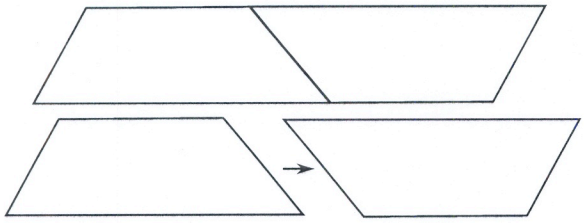
If you measure someone's height at a slant, it's an easy way to make them feel taller, but it's just not accurate. Because of the Pythagorean theorem the slant will always be longer than the true height. Don't use slants as heights, or I'll send my alien warriors to turn you into goo and feed you to their 4 headed....pet.....things..... anyway, let's look at more formulas.

Triangle. If you cut a parallelogram (or rectangle or square) in half from corner to corner you get a triangle so the triangle is the same formula as the rectangle and parallelogram divided by two.

Triangle: $A=\frac{bh}{2}$

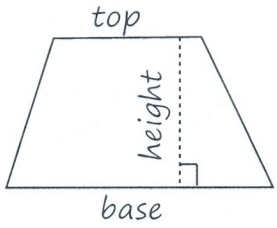


Trapezoid. The trapezoids formula looks like an alien, but it's just another chopped up parallelogram. If you cut a parallelogram in half, like anywhere, from top to bottom, even a slant, what you get is two trapezoids stuck together, but one of them is flipped over. Look at this...



If you add the base of the trapezoid to the top of that same trapezoid you get the length of the base of the parallelogram you so mercilessly hacked in half. So that would be A=(b+t)h to find the area of the parallelogram. To get just the trapezoid simply divide by 2. Confused? If so... just memorize the formula and you'll be fine. I just wanted you to know where it comes from.

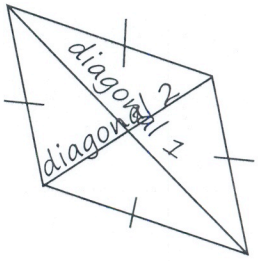
Trapezoid: $A=\frac{(b+t)h}{2}$ $Area=\frac{(base+top)(height)}{2}$



Rhombus. Okay, so really a rhombus is just a fancy parallelogram (more on that later) therefore it has the same formula. However, there is another way to calculate the area of a rhombus by using its diagonals. If you multiply the lengths of the diagonals and then divide by two...presto... you get the area. (It has to do with the triangles that make up the rhombus when you draw in diagonals, but I'll just give you the short version on this one.) By the way, the diagonals are the lines you get when you go from corner to corner.

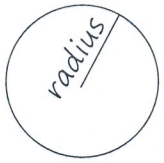
Rhombus using the diagonals:

$A=\frac{(d_1)(d_2)}{2}$ $Area=\frac{(diagonal\ 1)(diagonal\ 2)}{2}$



The last two are really easy...

Circle: $A=\pi r^2$ $A=(\pi)(radius^2)$

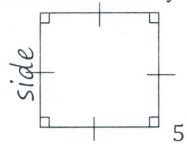


We have a whole chapter on circles coming. Just use the formula for now.

Square. Okay, this one is a rectangle but sometimes you only get one side so just square it (hence the name).

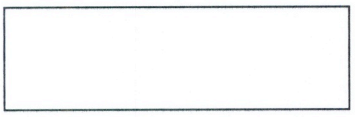
$A=s^2$ $A=side^2$

Square:



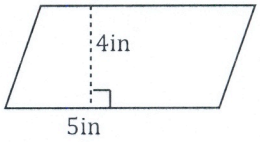
Write the name of each figure, the correct formula, and find the area of each.

1.

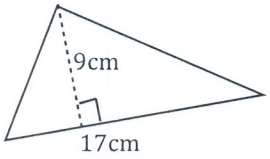


Rectangle
$A=bh$
$A=(15cm)(3cm)$
$A=45cm^2$

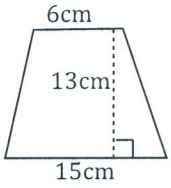
2.



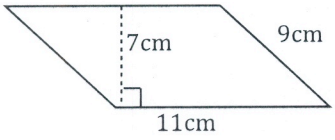
3.



4.



5.



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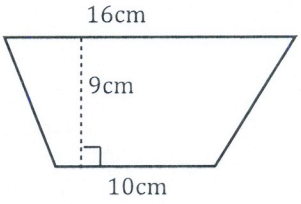
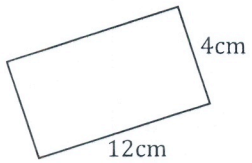


Bubble all the correct answers from above. Don't bubble incorrect answers.

○ 22.5 ○ 90 ○ 195 ○ 45 ○ 77 ○ 117 ○ 153 ○ 76.5 ○ 136.5 ○ 20

Write the correct formula and find the area of each...

7.



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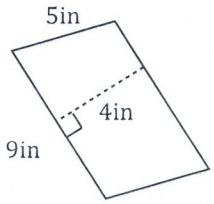
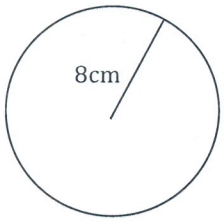


9.



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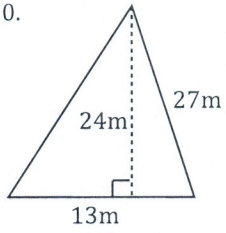
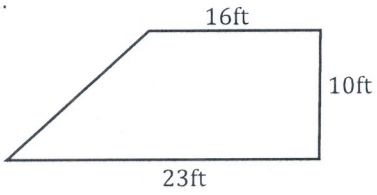
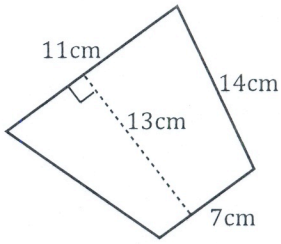


11.



12.

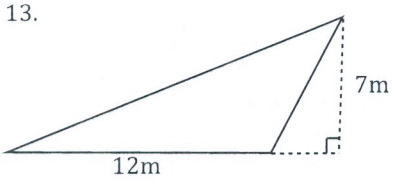


53

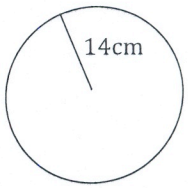
Bubble all the correct answers from above. Don't bubble incorrect answers.

○36 ○201 ○18 ○195 ○208 ○312 ○48 ○117 ○390 ○156

13.



14.



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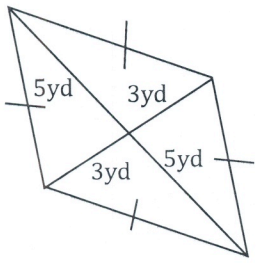

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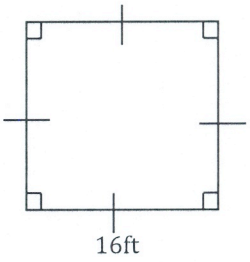

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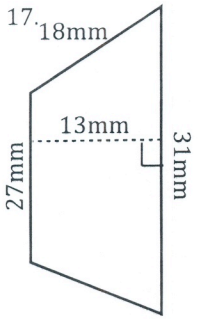

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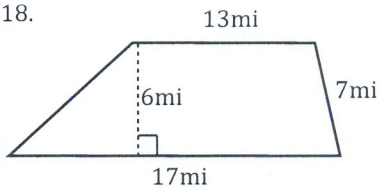

Bubble all the correct answers from above. Don't bubble incorrect answers.

○60 ○30 ○377 ○90 ○180 ○256 ○84 ○615.7 ○576 ○42

For these use the given information to solve for the indicated dimension. The first two are done for you.

31. The area of a rectangle is $72in^2$, the base is 9in long. Find the height of the rectangle.

$A=bh$

$\frac{72}{9}=\frac{9h}{9}$

$8in=h$

32. The area of a triangle is $46in^2$, the base is 8 in long. Find the height of the triangle.

$A=\frac{bh}{2}$

$2*46=\frac{8h}{2}*2$

$\frac{92}{8}=\frac{8h}{8}$

$11.5=h$

33. The area of a parallelogram is $15in^2$, the base is 5 in long. Find its height.

34. The area of a triangle is $32cm^2$, the base is 6cm long. Find the height of the triangle.

35. The area of a rhombus is $94ft^2$, one diagonal is 18ft long. Find the length of the other diagonal.

36. The area of a trapezoid is $68cm^2$, the base is 12cm long, the top is 11cm long. Find the height of the trapezoid.

37. The area of a trapezoid is $87m^2$, the base is 13m long, the height is 4m. Find the length of the top of the trapezoid.

38. The area of a triangle is $8in^2$, the height is 2in long. Find the base of the triangle.

Bubble all the correct answers from above. Don't bubble incorrect answers.

○8 ○9 ○30.5 ○11.5 ○9 ○5.9 ○10.4 ○75 ○10.7 ○32.5 ○4.8 ○6.1 ○8 ○3

39. The area of a circle is $64\pi ft^2$. Find the radius of the circle.

40. The area of a trapezoid is $65mm^2$, the top is 9mm long, the height is 11mm long. Find the base of the trapezoid.

41. The area of a triangle is $12mi^2$, the base is 4 mi long. Find the height of the triangle.

42. The area of a triangle is $98in^2$, the height is 26in long. Find the base of the triangle.

43. The area of a rhombus is $31ft^2$, one diagonal is 14ft long. Find the length of the other diagonal.

44. The area of a circle is $121\pi in^2$. Find the radius of the circle.

45. The area of a trapezoid is $19in^2$, the base is 3in long. The top is 7in long. Find the height of the trapezoid.

46. The area of a square is $169m^2$. Find the length of one side of the square.

Bubble all the correct answers from above. Don't bubble incorrect answers.

○7 ○3.8 ○14 ○4.5 ○6 ○7 ○4.4 ○13 ○6.2 ○4.8 ○2.8 ○7.5 ○7 ○42